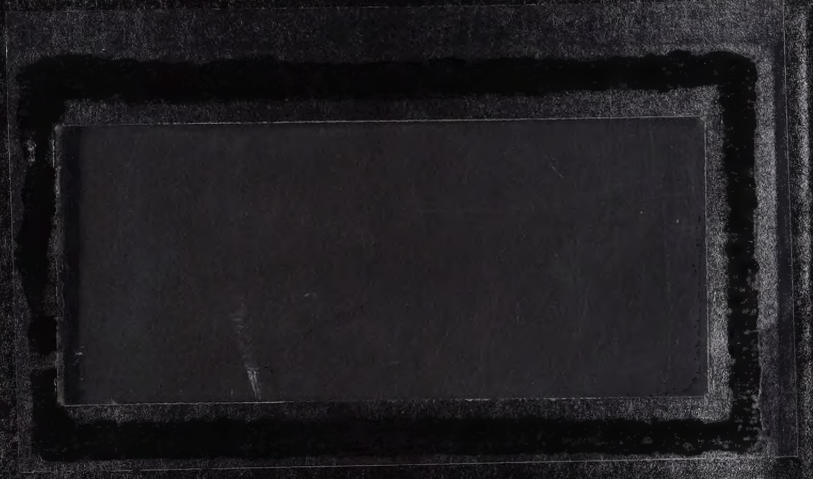
MODEL 1000A/1100A SYSTEM
PRECISION FM TRANSMITTER*

1000A Serial _____

1100A Serial _____

SOUND TECHNOLOGY

MP MASTER
MA26528



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SOUND TECHNOLOGY

Sound Technology Division
SIGMATEK, Inc.
10601 S. Saratoga-Sunnyvale Rd.
Cupertino, Calif. 95014

July 4, 1972

* Patented

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PRECISION FM TRANSMITTER

Demonstrate receiver or tuner performance with controlled listening tests

Includes 25μs for Dolby FM

DESCRIPTION

The 1100A Signal Conditioner and the 1000A FM Alignment Generator combine to form a miniature precision fm transmitter. This system converts program material from a phonograph or tape recorder into an extremely high quality fm stereo signal anywhere in the broadcast band. With the 1100A/1000A system you can easily and effectively demonstrate fm receiver performance with listening tests.

INCREASE YOUR DOLLAR VOLUME IN RECEIVER SALES

Sell your customer up to a better receiver by letting him make comparative listening tests using music you select. Let him hear the difference and he will buy the better receiver. With the 1100A/1000A system, you can control your music source. You are no longer at the mercy of fm stations, their program material, multipath, nearby traffic problems, weak signals, competitor's commercials, limited 4-channel material, etc.

USE 2-CHANNEL OR 4-CHANNEL PROGRAM MATERIAL

You needn't depend on local stations for program material. In addition to conventional stereo, you can transmit matrixed 4-channel material directly from a phonograph. Or connect your tape recorder through a matrix encoder to the Model 1100A to transmit discrete 4-channel tapes.

SOUND TECHNOLOGY

1400 DELL AVENUE
CAMPBELL, CALIFORNIA 95008
(408) 378-6540

How to demonstrate receiver performance

The tests below are easy to perform with the 1100A/1000A system, and they are easy to explain to your customer, but they dramatically show up deficiencies in receiver performance.

Distortion: Play the program source through the 1100A/1000A system, then play it directly through the receiver's amplifiers, bypassing the fm section. If the receiver is top quality, you will hear no difference in sound. Distortion contributed by the 1100A/1000A system is insignificant – less than 0.1%.

Tuning Characteristics: With the receiver in stereo and a strong signal from the 1100A/1000A transmitter, tune the receiver for optimum indication on its meters. Is the receiver distortion free? Can you tune the receiver slightly to either side without hearing distortion? If not, the receiver bandwidth is too narrow, and it will have to be tuned by ear and continually readjusted as it drifts, an inconvenience at best.

Overmodulation: The FCC allows significant overmodulation, and some receivers can't handle it. Purposely overmodulate the 1100A/1000A system using the meter to tell where you are. Receivers with inadequate bandwidth will break up on loud, high notes. These last two tests are good ways to sell up. Expensive receivers usually have more non-distorting bandwidth and will stand out in these tests.

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Sensitivity to Pilot Level: If the pilot detection circuitry in a receiver is inadequate, the sensitivity test above will reveal the deficiency. Turning the PILOT LEVEL control on the 1000A will help tell if this is the problem when a receiver sounds bad. The FCC permits as little as 8% pilot, and good receivers should get stereo at much lower pilot levels. If a receiver requires a high pilot level, it will work in stereo only on very strong stations and separation and distortion will depend on signal strength.

Separation: Turn the STEREO BALANCE control on the 1100A to either extreme position to transmit only one channel of the music. Evaluate receiver separation with listening tests.

Make a profit on receiver service

The 1000A is a proven profit maker in service. It speeds up receiver alignment and troubleshooting by a factor of 3 to 5. It has shown that it can pay for itself on only one service job a day.

Use the 1100A/1000A system to show a customer how his receiver sounds after servicing. It will help convince him you've given him the best service he can get.

Model 1100A/1000A system specifications

FM RF OUTPUT

TUNING RANGE: 88 to 108 MHz. 6:1 planetary drive provides better than 10 KHz tuning resolution.

DRIFT: No adjustment required after station frequency is set following ½ hour warmup.

TOTAL HARMONIC DISTORTION: Less than 0.1% THD at 1 KHz, 100% modulation.

RESIDUAL FM: Less than 75 Hz, 20 Hz to 15 KHz.

RESIDUAL 38 KHz SUBCARRIER: Less than 0.5%.

OUTPUT LEVEL: 0.5 to 30,000 μv into 50 Ω load, continuously adjustable.

OUTPUT IMPEDANCE: 50 Ω, VSWR less than 1.3, 200 Vdc isolation.

STEREO SEPARATION: Greater than 50 dB at 1 KHz.

METERING

MODULATION LEVEL: 0 to 150%, peak reading.

PILOT: 0 to 15%.

ACCURACY: ±7% of reading ±2% of full scale, 88 to 108 MHz, for audio frequencies 20 Hz to 15 KHz.

AUDIO INPUTS

FREQUENCY RESPONSE (TAPE INPUT, PRE-EMPH IN): Pre-emphasis standard ±0.5 dB, 20 Hz to 15 KHz.

FREQUENCY RESPONSE (PHONO INPUT, PRE-EMPH IN): RIAA standard combined with pre-emphasis standard ±0.5 dB, 20 Hz to 15 KHz.

INPUT IMPEDANCE: 50 KΩ, PHONO or TAPE.

INPUT LEVEL FOR 100% MODULATION: 7 to 15 mVac at 1 KHz on PHONO, 0.2 to 0.5 Vac at 1 KHz on TAPE.

OPTIONS

MODEL 1000A: All Model 1000A options apply.

GENERAL

MODEL 1000A DIMENSIONS: 8-3/8 inches high x 11-1/8 inches wide x 11-3/4 inches deep.

MODEL 1100A DIMENSIONS: 8-3/8 inches high x 5-1/2 inches wide x 11-3/4 inches deep.

POWER: 115 or 220 V ±10%, 50 to 60 Hz. Model 1000A, 12.5 w, Model 1100A, 6.5 w.

WEIGHT: Model 1000A – 12 lbs. Model 1100A – 6 lbs.

SHIPPING WEIGHT: Model 1000A – 18 lbs. Model 1100A – 10 lbs.

All prices f.o.b. Campbell, California – data subject to change without notice.

Printed in U.S.A. 8/74

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WARRANTY

All new Sound Technology products are warranted against defects in materials and workmanship for one year from the date of delivery. Any instrument or component that is found to be defective within the warranty period after examination by Sound Technology or an authorized representative thereof will be repaired or replaced without charge for labor or material. No other warranty is expressed or implied. We are not liable for consequential damages.

Before returning a product to Sound Technology for service, authorization must be obtained from the factory. For products not covered by the warranty, a purchase order should be forwarded to avoid unnecessary delay. Please include instrument model number and serial number with all requests for parts or service to facilitate the fastest possible response.

All products returned to the factory must be shipped prepaid. For products under warranty, Sound Technology will pay for shipment back to the customer.

INTRODUCTION

The Models 1000A FM Alignment Generator and 1100A Signal Conditioner combine to serve as an extremely low distortion FM transmitter. The 1100A accepts audio from a tape recorder or other auxiliary device or from a low level phonograph cartridge, equalizes, amplifies and pre-emphasizes the signal, and routes it to the external audio inputs of the 1000A. The 1000A multiplexes the audio and modulates its internal FM oscillator with a precision stereo signal. RF output level is continuously adjustable, and the 1000A can be tuned to any frequency in the 88 to 108 MHz band. To see how the 1000A can be used for stereo receiver or tuner service as well, refer to the 1000A manual.

SYSTEM CONNECTIONS

The 1000A, 1100A and audio source are to be connected as shown in Fig. 1. BNC cables for connecting the 1100A audio outputs to the 1000A external modulation inputs are supplied with the 1100A. A phonograph or tape recorder (or both) may be used as an audio source.

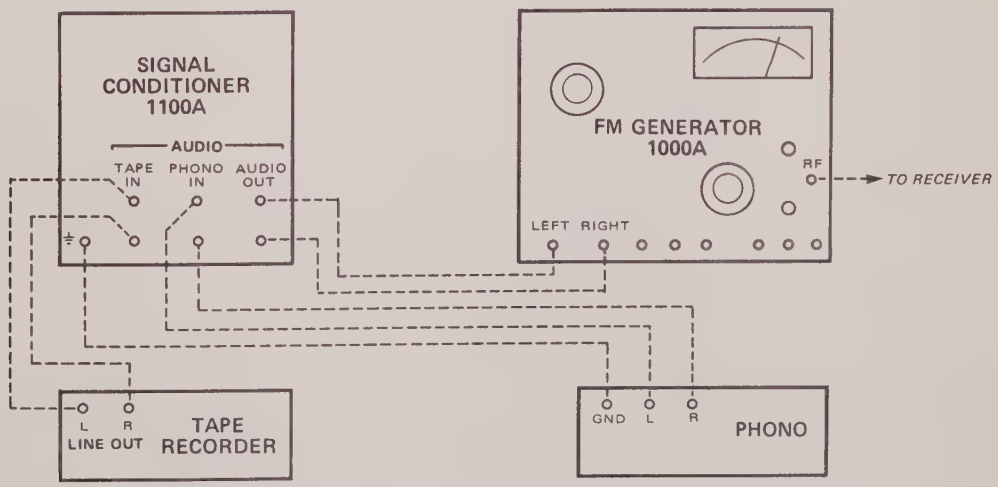


Fig. 1 System Connections

CONNECTION TO RECEIVER

The 1000A RF output may be coupled to the receiver in a variety of ways. Three alternatives follow:

1. Using the Sound Technology Model 100 Matching Transformer, connect the 1000A directly to the receiver antenna terminals. This method provides a signal of known level at the receiver antenna terminals because the signal level can be read directly from the 1000A RF LEVEL dial. This method is recommended for making critical receiver listening tests at known rf levels.

2. Connection may be made to a 75 Ω Master Antenna system using a directional coupler (Jerrold Model DC-12 UV or equivalent). Figure 2 shows the suggested method of correction. The 1000A should be connected to the directional coupler through a 50 Ω to 75 Ω transformer (Tekscan ZM57F or equivalent).

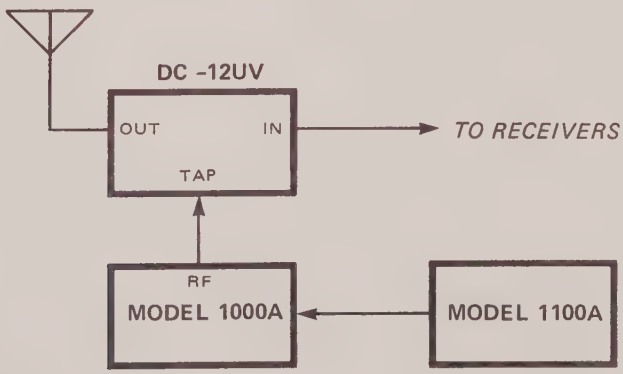


Fig. 2 Coupling to Master Antenna System

3. The 1000A can be used to radiate its rf signal a considerable distance with only a few feet of wire connected to its r.f. output. The user should be aware, however, that radiating a signal from the 1000A may violate FCC rules and regulations.

SYSTEM CONTROL SETTINGS

Preliminary adjustments should be made as follows:

1100A STEREO BAL: centered

1100A OUTPUT LEVEL: 3/4 of the way to maximum (about 3:00 o'clock)

1100A PROGRAM SOURCE: TAPE or PHONO, depending on the source used.

1000A INPUT: EXT

1000A PILOT LEVEL: to 100% on meter FM DEV % scale with the PILOT TEST push button depressed. This is actually 10% pilot, since the meter scale is expanded 10X with the button depressed.

1000A RF LEVEL: to 30,000 μv

1000A FREQUENCY: to any dead spot in the FM band

When the system is working, fine adjustments can be made. The following points should be kept in mind.

1. The 1000A RF LEVEL is continuously adjustable. The desired setting will depend on the antenna system used and on the type of receiver test (e.g. sensitivity) being made.

2. When using a tape recorder or other auxiliary source capable of a 2 volts or more output, the 1100A OUTPUT LEVEL control should be kept at about 3/4 of maximum, and the source level control should be used to set system level to avoid overloading the 1100A.

3. The 1000A meter (FM DEV % scale) should be used to make final program level adjustments. As a rule-of-thumb, levels should be set so the meter reads 40% or below on music

passages with average loudness. Setting the level too high will result in heavy overmodulation during a loud music passage, and many receivers "break up" when subjected to overmodulation. High frequency notes, particularly from a loud instrument result in extreme modulation levels.

Many FM stations overmodulate as a matter of practice. FCC rules permit this, stating:

> Para 73.268 "...In no case is it (modulation) to exceed 100% on peaks of frequent recurrance..."
>
> Para 73.317 "...Compliance with this specification will be deemed to show the occupied bandwidth to be 240 kc/s or less..."

Expensive receivers can usually withstand overmodulation better than others because they have more non-distorting bandwidth, and this is a good selling feature, easily demonstrated with the 1100A/1000A system.

Model 1100A Audio Amplifier Chain

The 1100A contains 2 identical amplifier chains, one for each channel. Each chain consists of 3 operational amplifiers. A block diagram of one amplifier chain is shown below.

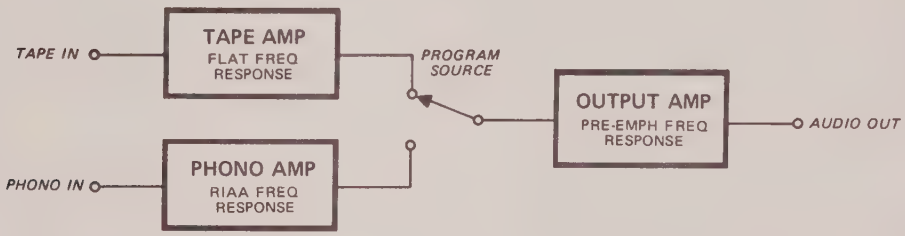


Fig. 3 1100A Amplifier Chain

The tape and phono amplifiers use the potentiometric operational amplifier configuration. In the drawing below and in the equations that follow, this configuration is described using a 709 type operational amplifier.

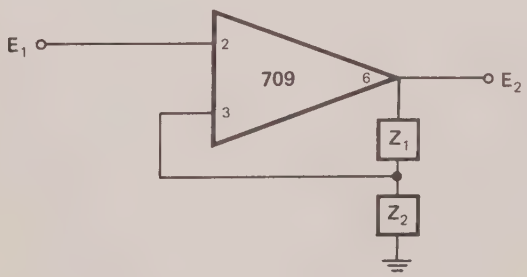


Fig. 4 Potentiometric Amplifier

$$\text{Gain} = \frac{E_2}{E_1} = \frac{Z_1 + Z_2}{Z_2}$$

If Z1 and Z2 are made up of resistors only, the gain is flat with frequency, as in the case of the tape amplifier, MC1 or MC4. Since Z1 =0 in the tape amplifiers, the gain equation reduces to:

$$\text{Gain} = \frac{E_2}{E_1} = 1$$

Z1 and Z2 are comprised of resistors and capacitors in the phonograph amplifier, MC3 and MC6, to provide RIAA equalization, which requires a variation of gain with audio frequency. The phonograph amplifier has a gain of 60 at 1 KHz.

The output amplifier is constructed in the summing configuration as described in the 1000A manual and shown below:

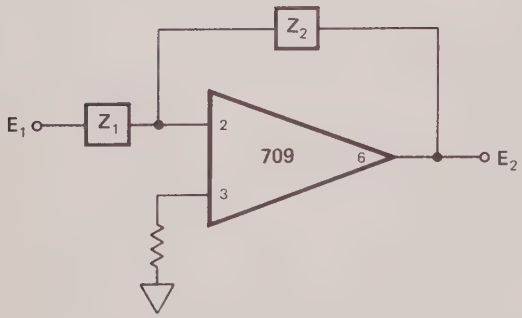


Fig. 5 Summing Amplifier

Gain for this operational amplifier configuration is:

$$\text{Gain} = \frac{E_2}{E_1} = \frac{Z_2}{Z_1}$$

The output amplifiers, MC2 and MC3, provide pre-emphasis by including a capacitive network in Z1, thus increasing gain at frequencies above 1 KHz. Output amplifier gain is 1.0 at 1 KHz with the PRE-EMPH switch OUT.

Model 1100A Power Supply

MC7 and MC8 are the plus and minus 15 volt regulator amplifiers. R61 and R62 form the reference divider for the +15 volt supply, and R66 and R67 form the reference divider for the -15 volt supply. Q1 and Q2 are the series regulators.

Model 1000A

For Model 1000A circuit operation, refer to the Model 1000A manual.

INTERNAL ADJUSTMENTS

The Model 1100A has no internal adjustments. For internal adjustment procedures on the Model 1000A, refer to the 1000A manual.

For instructions on Model 1100A cover removal, refer to Fig. 6.

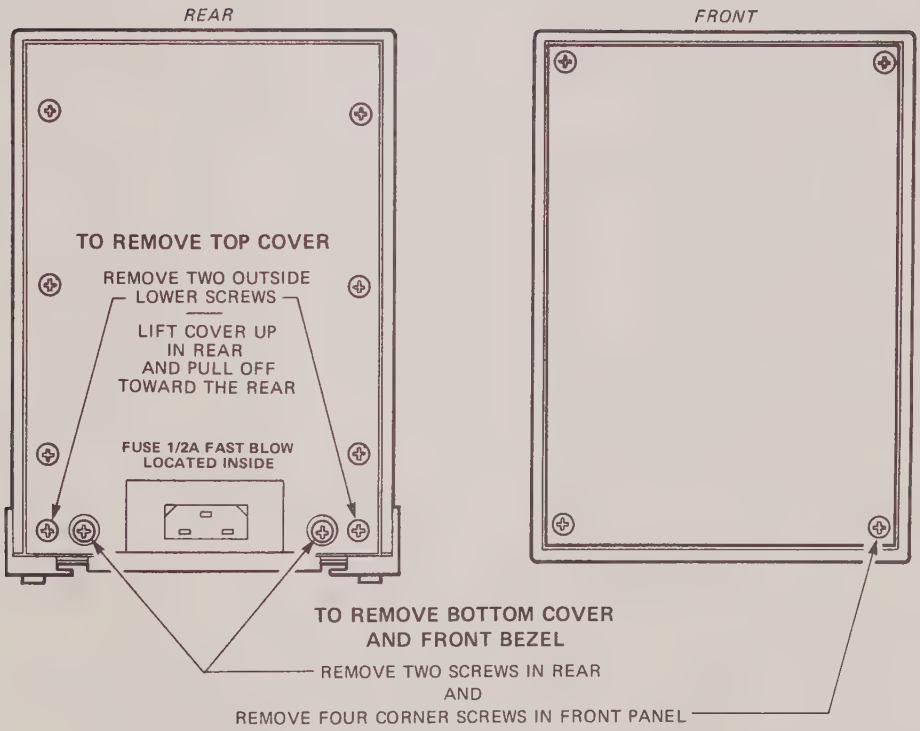
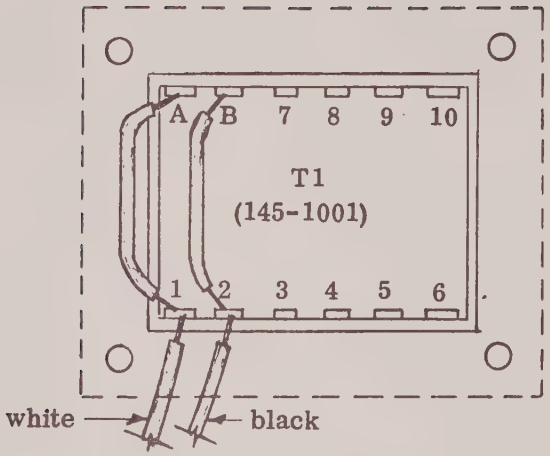
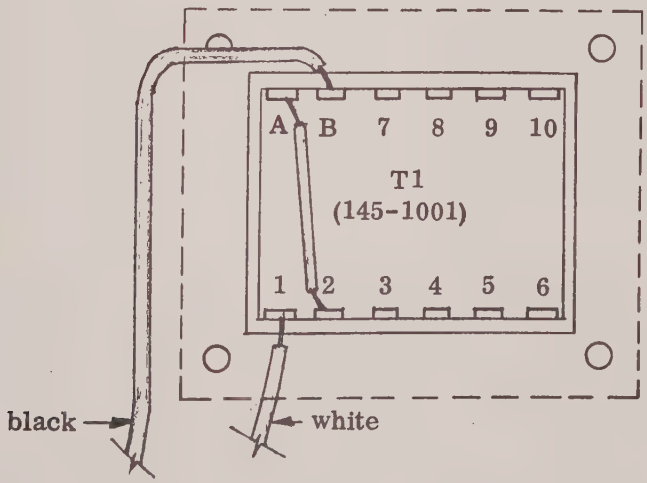

REAR
FRONT
TO REMOVE TOP COVER
REMOVE TWO OUTSIDE LOWER SCREWS
LIFT COVER UP IN REAR AND PULL OFF TOWARD THE REAR
FUSE 1/2A FAST BLOW LOCATED INSIDE
TO REMOVE BOTTOM COVER AND FRONT BEZEL
REMOVE TWO SCREWS IN REAR
AND
REMOVE FOUR CORNER SCREWS IN FRONT PANEL

Fig. 6 Cover Removal



Primary Wiring for 115V

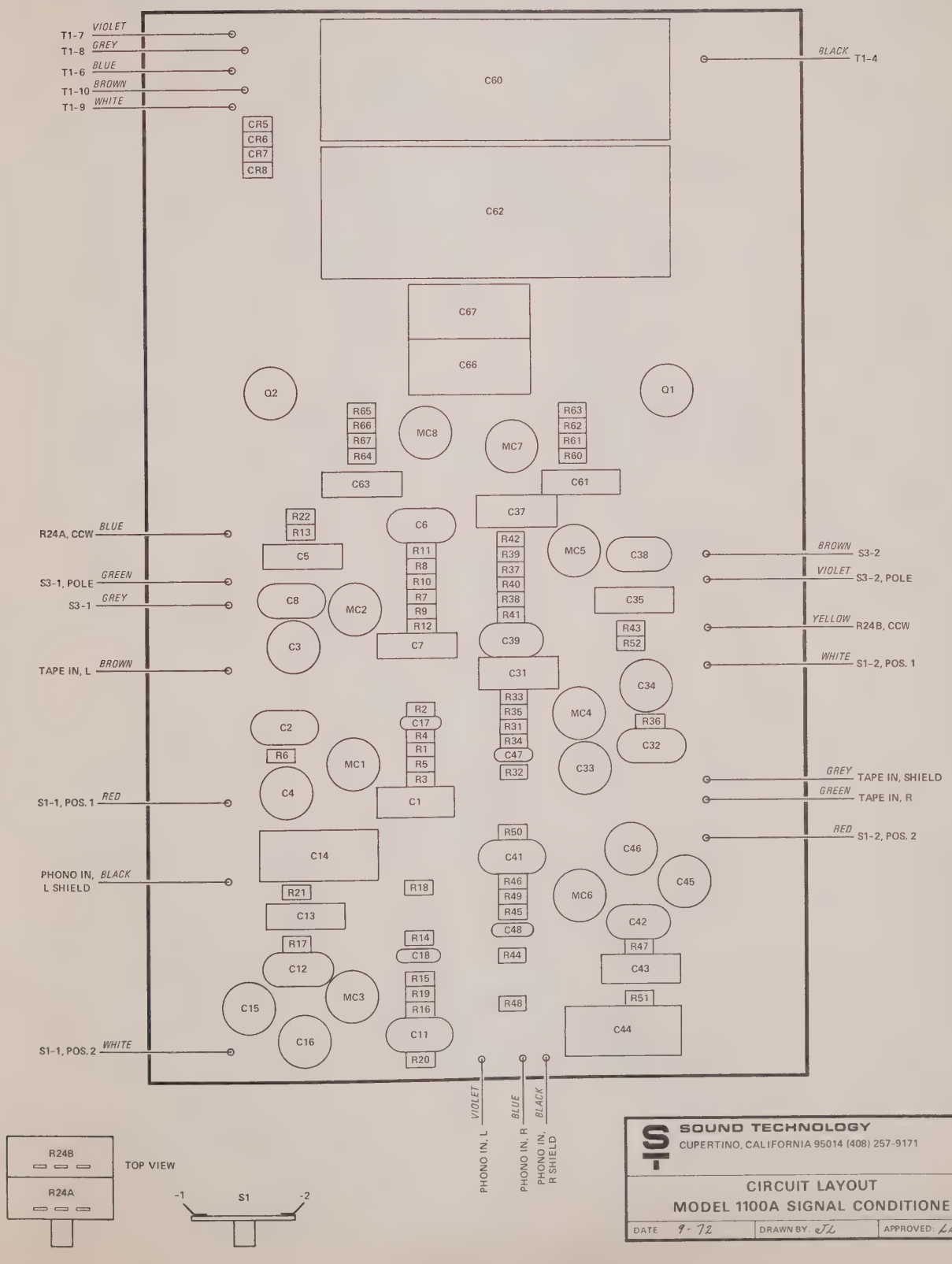


Primary Wiring for 230V

Fig. 7 Model 1100A 115/230 v Primary Wiring

REFERENCE DESIGNATION	DESCRIPTION	SOUND TECHNOLOGY STOCK NO.	MANUFACTURER	MANUFACTURER PART NO.
All fixed resistors except 1% values	R: Fxd, Comp, 1/4w, ±5%, 10Ω thru 1MΩ	100-1000 (10Ω) thru 100-1050 (1MΩ)	Allen-Bradley	Type CB
All 1% resistors	R: Fxd, Met Flm, 1/8w, ±1%, 100 ppm 90.9Ω thru 61.9kΩ	105-0900 (90.9Ω) thru 105-6192 (61.9kΩ)	Corning	NA55
R15A, B	R, Var, Comp, Dual 10k±10%	110-1031	A-B	JDIN200P103UA
R14	R, Var, Comp, 50k±10%	110-5030	A-B	JAIN056S503UA
C1, 31, 7, 37	C, Fxd, My, 100v, .001μf±10%	125-1020	Sprague	225P10291
C61, 63	C, Fxd, My, 100v, .01μf±10%	125-1030	Sprague	225P10391
C5, 35	C, Fxd, Polyst, .0068μf, 2.5%	126-6820	Mial	611-2 1/2%-63v
C13, 43	C, Fxd, Polyst, .015μf, 2.5%	126-1530	Mial	611-2 1/2%-63v
C14, 44	C, Fxd, Polyst, .056μf, 2.5%	126-5630	Mial	611-2 1/2%-63v
C2, 32, 8, 38	C, Fxd, Mica, 22pf, 10%	120-2200	Arco	DM15-220J
C12, 42	C, Fxd, Mica, 33pf, 10%	120-3300	Arco	DM15-330J
C11, 41	C, Fxd, Mica, 470pf, 10%	120-4710	Arco	DM15-471J
C6, 36	C, Fxd, Mica, 270pf, 10%	120-2710	Arco	DM15-271J
C64, 65	C, Fxd, CER, 2000v, .01μf	127-1040	Sprague	BL-S10
C66, 67	C, Fxd, Elect, 25v, 100μf	135-1010	Sprague	TE1211
C60, 62	C, Fxd, Elect, 50v, 1100μf	135-1120	Sprague	39D118G050HP4
C3, 4, 33, 34, 15, 16, 45, 46	C, Fxd, Elect, 25v, 15μf	136-1500	Sprague	502D156G025CC1C
CR5, 6, 7, 8	Diode, Si, IN4003	210-4003	General Instruments	IN4003

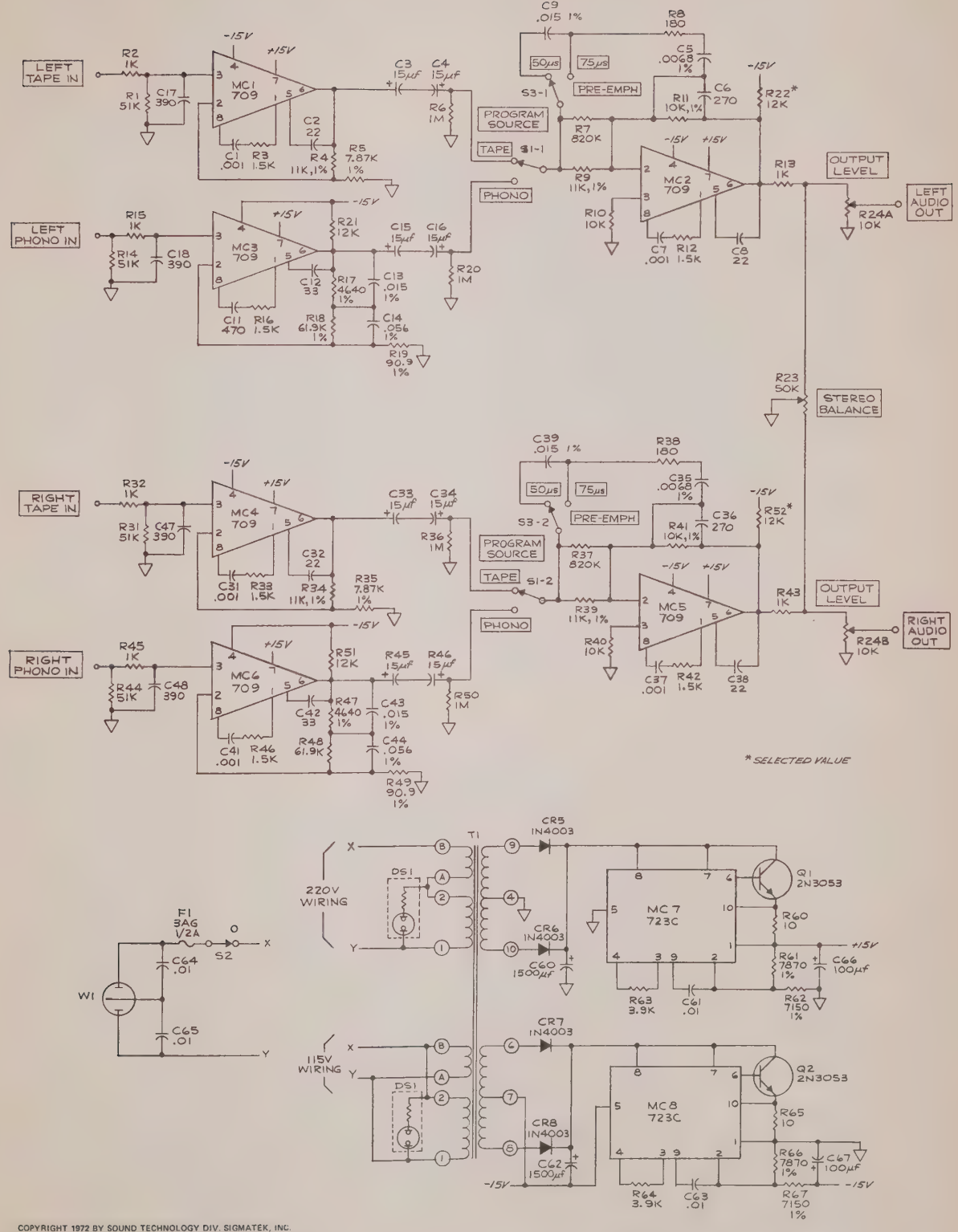
Q1,2	Transistor, Si, NPN, 2N3053	226-3391	National	2N3053
MC1,2,3,4,5,6, MC7,8	Int Ckt, 709C Int Ckt, 723C	250-7090 250-7723	MOT Fair	MC1709CG U5R7723393
T1	XFMR, Pwr w/T-Bracket	145-1000	SAE	12296
	Pwr Cord	310-1200	Belden	17250
	Pwr Socket	440-0301	Switchcraft	EAC-301
XF1	Fuse Post, 3AG	440-3570	Little Fuse	357001
F1	Fuse, 3AG, 1/2A	330-0500	Little Fuse	312.500
DS1	Indicator Light, Neon	321-1311	Leecraft	3GN1311-6
J1,2,3,4,	RCA Jack	420-3501	Switchcraft	3501 FP
J5,6	Connector, BNC	420-1094	Kings	KC79-35, TR-5 Finish
S1	SW, Rotary, 2P-2T	340-7500	Special	
S2	SW, Toggle, SP-ST	340-9492	C-H	8280K16
S3	SW, Toggle, DP-DT	340-9494	C-H	8363K7



SOUND TECHNOLOGY
CUPERTINO, CALIFORNIA 95014 (408) 257-9171

CIRCUIT LAYOUT
MODEL 1100A SIGNAL CONDITIONER

DATE	DRAWN BY	APPROVED
9-72	JL	LAM



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SOUND TECHNOLOGY
CUPERTINO, CALIFORNIA 95014 (408) 257-9171

CIRCUIT DIAGRAM
MODEL 1100A SIGNAL CONDITIONER

DATE	DRAWN BY	APPROVED
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DRIFT: No adjustment required after station frequency is set following ½ hour warmup.

TOTAL HARMONIC DISTORTION: Less than 0.1% THD at 1 KHz, 100% modulation.

RESIDUAL FM: Less than 75 Hz, 20 Hz to 15 KHz.

RESIDUAL 38 KHz SUBCARRIER: Less than 0.5%.

OUTPUT LEVEL: 0.5 to 30,000 μv into 50 Ω load, continuously adjustable.

OUTPUT IMPEDANCE: 50 Ω, VSWR less than 1.3, 200 Vdc isolation.

STEREO SEPARATION: Greater than 50 dB at 1 KHz.

METERING

MODULATION LEVEL: 0 to 150%, peak reading.

PILOT: 0 to 15%.

ACCURACY: ±7% of reading ±2% of full scale, 88 to 108 MHz, for audio frequencies 20 Hz to 15 KHz.

AUDIO INPUTS

FREQUENCY RESPONSE (TAPE INPUT, PRE-EMPH IN): Pre-emphasis standard ±0.5 dB, 20 Hz to 15 KHz.

FREQUENCY RESPONSE (PHONO INPUT, PRE-EMPH IN): RIAA standard combined with pre-emphasis standard ±0.5 dB, 20 Hz to 15 KHz.

INPUT IMPEDANCE: 50 KΩ, PHONO or TAPE.

INPUT LEVEL FOR 100% MODULATION: 7 to 15 mVac at 1 KHz on PHONO, 0.2 to 0.5 Vac at 1 KHz on TAPE.

OPTIONS

MODEL 1000A: All Model 1000A options apply.

GENERAL

MODEL 1000A DIMENSIONS: 8-3/8 inches high x 11-1/8 inches wide x 11-3/4 inches deep.

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POWER: 115 or 220 V ±10%, 50 to 60 Hz. Model 1000A, 12.5 w, Model 1100A, 6.5 w.

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SHIPPING WEIGHT: Model 1000A — 18 lbs. Model 1100A — 10 lbs.

All prices f.o.b. Campbell, California — data subject to change without notice.

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